Investigation by the Department of Telecommunications and Energy on its own Motion into Distributed Generation.	))))	D.T.E. 02-38

INITIAL COMMENTS OF
FITCHBURG GAS AND ELECTRIC LIGHT COMPANY

I. INTRODUCTION

Fitchburg Gas and Electric Light Company ("FG&E" or "Company") files these comments in response to the Notice of Inquiry ("NOI") and Order Opening Investigation issued by the Department of Telecommunications and Energy ("Department") on June 13, 2002, into distributed generation ("DG"). Specifically, the Department raised four questions, answers to which are set forth below.

FG&E welcomes the opportunity to participate in this investigation and commends the Department for initiating this proceeding to address the key issues surrounding DG. As defined under Massachusetts law, DG includes generating facilities which are connected directly to the facilities of a distribution company or a retail customer, and which alleviate or avoid transmission or distribution constraints, or the installation of new transmission or distribution facilities. M.G.L. c. 164, §1. As the Department has recognized, the potential growth of DG raises significant issues in regards to safety and reliability of the distribution system and the allocation of associated costs and revenues.

The statutory definition of DG highlights its most significant benefits: the avoidance of new transmission and distribution ("T&D") facilities and T&D constraints. Regardless of whether the

DG is installed by a distribution company, a retail customer or a third party, the Department will need to address how the benefits and costs of DG are shared among the affected parties: the DG participant, the T&D customers and the distribution company. The Department should also consider the potential impact of DG on reliability and the obligations of the distribution company. While DG may offer a lower cost alternative to other T&D investment, it could result in a lower quality of service unless requirements are adopted to address the issues of reliability, power quality and the voluntary or involuntary shutdown of a DG facility.

The Department has also recognized the need to remove barriers to the development of DG, which barriers may include varying interconnection standards and uncertainty regarding the costs and rates for standby and back-up service. In acting to encourage the development of DG, the Department should also be cognizant of the potential to create new stranded investment through the encouragement of duplicate facilities. FG&E believes that it will be critical for the affected parties to work together to address all of these issues, and present a consensus recommendation to the Department.

FG&E looks forward to submitting reply comments and participating in the planned public hearings. Because DG is an important and complex issue, the Company recommends that the Department consider establishing a collaborative process to attempt to resolve the multiple issues likely to be identified in this investigation. In addition to addressing the issues thus far identified by the Department, a collaborative could be useful in trying to resolve many of the technical and policy issues surrounding DG, including: 1) what is DG; 2) who can own it; 3) interconnection requirements; 4) reliability and power quality impacts; 5) pricing and design of standby and back-up services; 6)

operational and control parameters; 7) impact upon the distribution company's obligation to serve and performance standards; 8) economic evaluation of DG as an alternative to T&D investment; 9) the sharing of cost and benefits of DG; and 10) how to avoid the creation of stranded investment and duplicate facilities.

II. RESPONSES TO DEPARTMENT QUESTIONS

1. Refer to current distribution company interconnection standards and procedures in Massachusetts. Do these standards and procedures act as a barrier to the installation of distributed generation? If so, please describe.

a. If the current standards and procedures act as barriers to the installation of distribution generation, please describe what steps the Department should take to remove these barriers. As part of this response, please discuss whether the Department should establish uniform technical interconnection standards and procedures for distributed generation.

The technical requirements of the interconnection documents do not act as a barrier to the installation of DG in Massachusetts. The interconnection requirements are set forth to protect the distribution companies' systems from damage by the generator, and the interconnection requirements are the same requirements followed by the distribution companies themselves.

Nevertheless, the Department should adopt uniform standards and procedures for DG, and should do so by incorporating the uniform requirements document currently being created by the distribution companies. Generally, the distribution companies have the same content in their requirements documents, but use different layouts and application documents which may create customer confusion. To make the process easier for a small generator owner, the distribution companies have joined together to provide a more uniform and simplified process for interconnection for smaller units. Although the document will allow for special cases in which the standards of the

distribution companies will naturally differ, the uniform requirements document being developed is a proactive attempt to ease the interconnection process for the majority of the applicants. The distribution companies believe this simplified process will cover 80 to 90% of the interconnection requests.

The distribution companies plan to have the requirements for smaller units documented by October 1, 2002. The distribution companies have met in June and July, and plan to meet as many times as required prior to October 1, 2002, to complete the goal. Presently, there is a draft process chart that has been sent to each distribution company for comment. In drafting the standards, the following documents are serving as references for the distribution companies: (1) IEEE P-1547; (2) Model Distributed Generation Interconnection Procedures and Agreement – NARUC; and (3) Various Utility Interconnection Requirements Documents.

b. Please comment on whether the Department should adopt the IEEE's uniform technical interconnection standards, or the uniform standards adopted by other states, for use in Massachusetts.

FG&E requests that the Department not adopt the IEEE P-1547 as a specific requirement, but suggests that it be used as a general guideline. The IEEE P-1547 has been in the creation process for a number of years, and it is not known when it will be balloted and accepted by the IEEE standards group. Because the IEEE P-1547 is a general document attempting to encompass all generator interconnections, it does not include sufficient detail to help the majority of customers. The Department should not delay its process waiting for the IEEE to ballot and approve the P-1547 document. Instead, for the smaller units, the Department should adopt the uniform requirements document being created by the distribution companies, since it will result in a more simplified process and requirements for most applicants. For larger and more complicated units, the specific distribution company requirements should still be used.

2. Refer to current distribution company standby service tariffs. Do these tariffs act as a barrier to the installation of distributed generation? If so, please describe.

(a) Please discuss the appropriate method for the calculation of standby or back-up rates associated with the installation of distributed generation. As part of this response, please discuss whether other states have established policies regarding back-up rates associated with distributed generation that may be appropriate for adoption in Massachusetts.

FG&E does not currently have a standby service tariff; however, FG&E does have Rate Schedule QF, Rates Applicable to Qualifying Facilities and On-Site Generating Facilities. Under this schedule, customers that request supplementary, back-up, maintenance, or interruptible power shall receive such service under the rate schedules applicable to all customers for such service, regardless of whether they generate their own power.

The lack of standby service tariffs does potentially create a barrier to DG. Anyone that is contemplating the installation of DG needs to have standby, back-up, maintenance and supplemental tariffs in order to determine if the economics of the proposed DG project would compare favorably to traditional utility supplied T&D services.

In developing back-up or standby rates, the Department must provide a fair cost allocation among participants and all customers, minimize costs to customers, and ensure the distribution companies receive adequate cost recovery. In addition, the rate design should facilitate customer DG by sending the appropriate price signals to potential DG participants.

The Department should consider that the distribution companies would likely require a set of different rates. Potential DG participants may have different needs and requirements so that, at a minimum, a back-up or standby rate, a maintenance rate and a supplemental rate with pricing

alternatives (tiers) based on different levels of customer commitment (physical assurance) regarding the DG facilities would be necessary.

The development of back-up or standby rates should include all the costs of the facilities necessary to provide the customer with the service. If the distribution company has to install and/or maintain facilities in a manner essentially the same as if the customer were taking full requirements service, the resulting rate structure for DG facilities should reflect that cost.

An issue to be addressed with respect to back-up and standby service is that the Department should implement restrictions or require DG owners to enter into contracts or agreements with the distribution companies to ensure that DG owners will not use back-up or standby service, instead of their DG. In certain instances (e.g., fuel price spikes), it may be more cost-effective for DG owners to shut down their DG units, and to take back-up or standby service and sell their fuel in the market at the higher price. Distribution companies would need for DG to remain on-line in such situations; otherwise the benefits of DG, along with the integrity of the distribution company's system, may be compromised. For these reasons, DG owners should be required by contract or agreement with the distribution companies, or should be otherwise restricted, to keep their DG units running.

The next question is what costs should be included in the development of the back-up or standby rates. At this stage, FG&E does not have technical details to provide regarding this issue. FG&E began discussion on this issue with representatives from other distribution companies. However, this issue will take some time to develop, and thus FG&E suggests that the Department provide a forum for the distribution companies and other stakeholders to address this issue.

Another issue for consideration is the possibility of DG customers to bypass societal charges (energy efficiency and renewables) and transition charges. For low levels of DG resources on a

distribution system, the absence of these charges results in minor decreases in the level of funding available and a small increase in the level of societal costs that must be recovered from other ratepayers. For high levels of DG resources on a distribution system, the absence of these charges would cause the remaining ratepayers to incur a larger burden.

3. Please discuss the role of distributed generation with respect to the provision of reliable, least-cost distribution service by the Massachusetts distribution companies.

DG may benefit distribution companies by: (1) providing additional competitive options for T&D projects and generation; (2) potentially reducing customer energy demands on electric distribution systems; and (3) improving specific customers' power quality and reliability.

DG located on the distribution system – whether by a distribution company, a third party working with the distribution company, or a customer placing DG on his premises – may have the potential to reduce and/or delay the need for transmission and distribution upgrades, and to increase the utilization of existing assets, which refers to the average loading of a distribution company's electrical system. Distribution companies must plan for peak loading conditions, and a typical feeder may be loaded to peak conditions for only short periods during the year. If DG is used primarily to serve peaking type loads, the load factor of a circuit will improve, and the distribution system will be loaded to a higher percentage of its maximum capacity more of the time. In that way, a distribution company's assets would be more fully utilized. Distribution companies could use their planning expertise to conduct a strategic review of their T&D system and identify key feeders and substations with fast-growing load or poor utilization that may benefit from DG deployment.

DG may also have a positive impact on system and local distribution reliability and power quality. On the other hand, without appropriate modifications to the existing T&D infrastructure

and appropriate interconnections, DG may have a negative impact on system and local distribution reliability and power quality. For a distribution company, the economic impact of poor reliability is increased operating expenditures for emergency repairs and restoration. An analysis of a DG applicant's load and local reliability/power quality data may allow the distribution company to identify locations where DG may have the best chance of improving reliability/power quality. Distribution companies could work strategically with energy service companies, vendors and customers to contract for DG in places where enhancements are desired.

a. What steps should the distribution companies take in order to identify areas where the installation of distribution generation would be a lower-cost alternative to system upgrades and additions?

Distribution companies should review and quantify the effect that DG will have on their distribution planning criteria and processes; system protection, reliability, and power quality; and operations and safety. The results of this review may establish references for costs and reliability impacts associated with these topics (and others identified). This reference material may then be used to compare DG and T&D projects, and may reflect the impact these projects may have on value delivered to the customer.

The distribution companies may compile the capacity and other costs of service into a format that is easily compared to DG projects, for example: a cost/energy-yr value by circuit or service area. Distribution companies may quantify the cost of reliability and power quality on a customer or location specific basis for comparison of reliability improvement projects. This cost may be represented, for example, by a cost/yr benefit for hours or outage instance saved. The comparison may utilize a present worth analysis that compares the DG project versus the distribution company's costs,

reliability and power quality impacts of each option. This comparison should include all costs of a distribution company's accommodation of DG.

The distribution companies' planning processes currently include gathering related performance data, load forecasting, and contingency planning, combined with analysis and good engineering design practices to determine the most cost effective, efficient design and operation of the system. The distribution planning process impacts construction budgets, operating procedures, rates design, and various other operations processes. The distribution planning review may also include DG topics such as safety, protection, power quality, reliability, line losses, frequency control, generator control, voltage/var control, cold-load pickup, load shedding, and other transmission and distribution planning, generation, and operations issues. In addition, such planning should include a study of a distribution company's obligation to serve, since assessing total system loads is necessary for proper system planning. (The impact of DG on the obligation to serve is discussed in detail in Section II.4.a. below.)

b. What steps should the distribution companies take to encourage the installation of cost-effective distributed generation in their service territories?

Wherever possible, distribution companies should standardize and simplify the process, contractual relationships and hardware required to interconnect DG resources in a safe and beneficial manner for all parties involved. The creation of an interconnection manual that anticipates important issues or problems, as well as outlines means for dispute resolution, should be established. At a minimum, the manual should encompass the following: adherence to applicable codes, standards, IEEE/ANSI guidelines, and good engineering practice; interconnection requirements for hardware, construction, and pre/post installation certification; effects and mitigation of effect on interconnected

systems with respect to power quality, reliability, and safety; cost/benefit impacts; and going forward operations and administration management. The manual should be developed through a collaborative process among the distribution companies, the Department, and DG community, and should include discussion on operational aspects and environmental treatment of DG resources.

In addition, consideration should be given to developing a trial program that would allow the parties to test the anticipated benefits and risks of DG, and to evaluate the responsiveness of the market prior to implementation of any new rules and regulations by the Department. The trial program would also help to identify and resolve market barriers as well as distribution company disincentives.

4. What other issues are appropriate for consideration as part of the Department's investigation of distributed generation?

In addition to the issues addressed above, the Department should also consider: (1) the obligation to serve; (2) DG ownership by distribution companies; (3) impacts on PBR; and (4) power quality concerns.

a. Impacts on Distribution Companies' Obligations to Serve

Pursuant to G.L. c. 164, § 1B, after March 1, 1998, until terminated by effect of law or otherwise, a distribution company in Massachusetts has:

> the exclusive obligation to provide distribution service to all retail customers within its service territory, and no other person shall provide distribution service within such service territory without the written consent of such distribution company which shall be filed with the department and the clerk of the municipality so affected.

DG would no doubt impact a distribution company's obligation to serve, and the Department should consider the full ramifications, some of which are discussed below, prior to implementing any new rules or regulations on DG.

The Department must consider whether a distribution company will continue to have the obligation to serve all customers in its service territory, or whether the distribution company will be relieved of part or all of that obligation with respect to those customers where DG was chosen as an alternative to traditional T&D service, regardless of whether the DG performs.

In order for a distribution company to realize any load reduction benefit from DG, it must be able to avoid the incremental T&D investment otherwise required to serve the load to be served by the DG. However, use of DG in lieu of traditional T&D facilities could result in a "lower" quality service to customers in the load area served by the DG. Is it appropriate to provide a lower quality of service to certain customers at the normal T&D charge? Should those customers have some say in whether they are to be the recipient of the lower quality of service?

b. Distributed Generation Ownership by Distribution Companies

The Department should also examine who may install, own and operate DG, in particular the role of distribution companies and their unregulated affiliates in DG facilities. The right of distribution companies to own DG should not be encumbered in any way. The participation in the DG market by some distribution companies will not provide an opportunity to exercise market power or restrict the ability of competitors to enter the market. The Department has in place rules governing the standards of conduct for distribution companies and their affiliates to prevent market power abuses. See 220 CMR 12.01 et seq. There is no compelling reason why distribution companies and their unregulated affiliates should not be allowed to participate in DG, particularly for safety and reliability

reasons. Company-side DG installations may be cost effective alternatives to utility-owned upgrades to the distribution system.

Distribution company control of DG facilities, particularly on the company side of the meter, is essential for safety and reliability reasons. Utilities have primary responsibility for the integrity and reliability of their systems, as well as the safety of the public.

If DG is intended to be an alternative to distribution wires, the distribution companies must have some means of control. As also discussed in Section II.2.a. above with respect to standby and back-up service, DG owners cannot have exclusive discretion regarding when they run their DG units, since in that instance DG would not be an alternative to distribution wires. Instead, DG owners and distribution companies should enter into agreements specifying how the DG units will be operated to support the integrity of the distribution system.

c. Impacts on PBR

DG may impact performance based regulation ("PBR") in three respects: (1) initial PBR cast-off rates; (2) price cap mechanism; and (3) service quality measures.

1. Initial cast-off rates

FG&E recently filed a rate case with the Department intended by FG&E to set the cast-off rates for the Electric Division under a PBR mechanism. The PBR is designed to be in place for the period from January 1, 2003 through December 31, 2112. Because of the timing of the rate case and the Department's NOI in this proceeding, FG&E's proposed cast-off rates do not take into account any impact of DG. Currently, plant investment, operation and maintenance costs, and financing costs do not exist in the revenue requirements for DG-related retraining, equipment and facilities. Any new rules or

regulations issued by the Department relative to DG should recognize the additional burdens of DG equipment and facilities and related operation and maintenance expenditures while FG&E's PBR mechanism is in effect.

2. Price Cap Mechanism

DG may impact the following components of the price cap mechanism:

- **Exogenous Cost Factor**: FG&E's proposed PBR permits FG&E to seek recovery of exogenous costs during the PBR period. Changes in regulatory rules or state legislation regarding DG during the period of PBR should, in fairness, be included as an exogenous cost factor for cost recovery of DG investment.

- **Service Quality Revenue Penalty Factor:** FG&E believes that DG activities undertaken by the distribution companies would have an impact on certain service quality measures. Each measure and the potential impact of DG on the measure is provided below in the next section: Service Quality Measures.

3. Service Quality Measures

DG may impact the service quality measures, in particular, two indices of customer satisfaction are discussed below:

- **System Average Interruption Duration Index (SAIDI).** Since this index is a measure of the time duration that customers are without power, DG activities undertaken by a distribution company may have a significant effect on this measure. Whether DG improves this measure or harms the distribution company's ability to meet it will only be borne out in actual experience.

  Currently, when an outage occurs, distribution company personnel must restore service in accordance with specified state, federal and company safety rules and work procedures. When it is known that a source of electric energy is connected to the system, current work practices dictate that workers verify that all such sources of electric energy be accounted for and operationally controlled. Accounting for and operationally controlling multiple potential sources of energy to the energy delivery system can create a work demand that may consume resources and delay the restoration of service. This delay in the restoration of service may increase the probability of incurring a revenue penalty for this performance measure without fault of the distribution company.

On the other hand, DG facilities capable of being connected to the distribution circuit will increase the operational complexity of the distribution system because DG facilities may create multi-direction energy flow on a distribution circuit. Therefore, DG facility connection to the distribution system may, under certain circumstances, facilitate the restoration of service. Specifically, where extensive and time consuming repairs are required on a part of the energy delivery system between a single utility source and a number of customers, localized DG may provide emergency power to these isolated customers until permanent repairs are made to the energy delivery system.

?? **System Average Interruption Frequency Index (SAIFI)** Since this index is a measure of the frequency that customers are without power, DG activities undertaken by the distribution company may have an affect on this measure. DG equipment, like any equipment connected to the distribution system, is subject to failing. In most instances, appropriate circuit and equipment protection would isolate the DG equipment without disruption to the remainder of the customers on the circuit. However, although the probability of such an occurrence is small, instances may arise where DG equipment failure may cause an outage to the remainder of the circuit customers. In FG&E's estimation, DG facilities connected to the distribution system will not prevent nor reduce the number of normally occurring outages typically experienced by distribution circuits. Outages caused by adverse weather conditions, motor vehicles accidents, animal contacts with energy delivery equipment will still occur.

d. Power Quality Concerns

DG may impact the quality of the power received by customers connected to a distribution company's system. Relative to customers, the problems associated with power quality are similar to the problems with reliability. A brief interruption or other power quality problem can cause equipment malfunction, deterioration, or failure and result in lost production, a reduction in production quality, or increased operating costs.

Resolving power quality issues requires a working knowledge of the dynamics of the distribution system, the DG, the customer, and others on the system. Many times, the interaction of these components results in the problem. Generally, the requirement that DGs meet or exceed industry standards and guidelines (See ANSI/IEEE 519, ANSI/IEEE PC37.108-19, UL 1741, IEC 1000-3, ANSI/IEEE C37.95 and others) should reduce the potential for problems. The following topics will

have to be addressed by the distribution companies, the DG and other customers to ensure that the quality of the power is not adversely affected:

- **Voltage flicker.** DG output variations can result in voltage flicker if the DG is relatively large compared to the circuit capacity. IEEE std. 519 discusses in some detail this interaction and potential mitigation techniques. Voltage variations can lead to equipment malfunction, failure, and overheating.

- **Frequency**. DG output variations and the possibility for islanding a DG with some customers has the potential to affect the frequency of the voltage. Frequency fluctuations can lead to equipment malfunction, failure, and overheating.

- **Steady-State voltage and current wave shape distortion (harmonics).** Solid state DG equipment can generate harmonics that affect others on the interconnected system. If these harmonics are large enough, they can distort the voltage seen by others on the circuit. IEEE std. 519 discusses in some detail this interaction and potential mitigation techniques. Voltage distortion can lead to equipment malfunction, failure, and overheating.

- **Harmonic Resonance.** The addition of DG to a circuit must be analyzed for the potential for harmonic resonance under certain circuit configurations to determine whether extreme overvoltage conditions may exist. Extreme overvoltages can cause equipment failure on the distribution companies' and customers' systems, as well as create unsafe conditions.

- **Voltage sags and swells.** DG can cause swells when it trips off the system. Sags can be caused by the startup of a generator that requires system support to run. These sags and swells can cause equipment malfunction, and, in extreme cases, equipment failures.

- **Voltage transients:** Voltage transients can be caused by DG switching events, DG system malfunctions, or DG capacitor switching. Transients can create equipment insulation failures, equipment malfunctions, and, in extreme cases, equipment failures.

- **Undervoltage and Overvoltage**: Longer term DG output variations can result in under or overvoltage conditions if the DG is relatively large compared to the circuit capacity.

- **System stability.** If the DG is relatively large in comparison to the circuit capacity or an islanding condition exists, the system connected to the generator can become unstable resulting in frequency and voltage variations.

- **Electromagnetic noise:** DGs can introduce noise if there exists a quality of design issue, poor grounding, or lack of filtering.

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